We claim:

1. A method of recovering a precious metal from a source material, comprising:

a) contacting a source material comprising at least one precious metal with a solution comprising an ammonium salt, a halogen salt and an oxidant;

b) recovering at least a portion of the at least one precious metal from the solution.

2. The method of claim 1, wherein an ammonium salt is provided to the solution by an ammonium-containing compound selected from the group consisting of ammonium sulfate, ammonium iodide, ammonium bromide, ammonium chloride, ammonium fluoride, ammonium acetate, ammonium carbonate, ammonium chromate, ammonium nitrate, ammonium oxalate, ammonium phosphate, and mixtures and combinations thereof.

3. The method of Claim 1, wherein the concentration of the ammonium salt is approximately 0.01 gram-moles per liter to approximately 2 gram-moles per liter of the solution.

4. The method of Claim 1, wherein the halogen salt is provided to the solution by a halogen containing compound selected from the group consisting of hydrogen chloride, hydrogen bromide, hydrogen iodide, hydrogen fluoride, sodium chloride, sodium bromide, sodium iodide, sodium fluoride, potassium

chloride, potassium bromide, potassium iodide, potassium fluoride, ammonium chloride, ammonium bromide, ammonium iodide, ammonium fluoride, and mixtures and combinations thereof.

5. The method of Claim 1, wherein the concentration of the halogen salt is approximately 0.01 gram-moles per liter of solution to approximately 2 gram-moles per liter.

6. The method of Claim 1, wherein the ammonium salt is provided to the solution by an ammonium containing compound selected from the group consisting of ammonium iodide, ammonium bromide, ammonium chloride, ammonium fluoride, ammonium acetate, ammonium carbonate, ammonium chromate, ammonium nitrate, ammonium oxalate, ammonium phosphate, and mixtures and combinations thereof, and the halogen salt is provided to the solution by a halogen containing compound selected from the group consisting of ammonium iodide, ammonium bromide, ammonium chloride, ammonium fluoride, and mixtures and combinations thereof.

7. The method of Claim 1, wherein the oxidant is gaseous.

8. The method of Claim 1, wherein the oxidant is selected from the group consisting of nitrogen oxides, nitrosyl chloride, chlorine, bromine, iodine, fluorine, ozone and hypoclorite.

9. The method of Claim 1, wherein the oxidant is gaseous and is provided to the solution by the introduction of at least a first liquid reagent and at least a second liquid reagent.

10. The method of Claim 9, wherein the first liquid reagent is selected from the group consisting of hypochloric acid, sodium hypochlorite, potassium hypochlorite, ammonium hypochlorite, alcohol, and mixtures and combinations thereof, and the second liquid reagent is selected from the group consisting of nitric acid, sodium nitrate, potassium nitrate, ammonium nitrate, and mixtures and combinations thereof.

11. The method of Claim 1, wherein the oxidant is introduced into the solution as a gas.

12. The method of Claim 1, further comprising heating the solution to a temperature less than approximately 150 degrees Celsius.

13. The method of Claim 1, further comprising heating the solution to a temperature in the range of approximately 50 degrees Celsius to approximately 100 degrees Celsius.

14. The method of Claim 1, wherein the pH of the solution is less than approximately 10.

15. The method of Claim 1, wherein the pH of the solution is approximately 0.5 to approximately 8.

16. The method of Claim 1, wherein the solution further comprises an acid.

17. The method of Claim 1, wherein the at least one precious metal is selected from the group consisting of platinum, iridium, osmium, palladium, rhodium, ruthenium, gold and rhenium.

18. A method of separating a precious metal from a source material, comprising:

a) combining a source material containing at least one precious metal with a solution comprising at least one ammonium salt, at least halogen salt and at least one gaseous oxidant.

b) separating at least a portion of the at least one precious metal from the solution.

19. The method of claim 18, wherein the at least one ammonium salt is provided to the solution by an ammonium-containing compound selected from the group consisting of ammonium sulfate, ammonium iodide, ammonium bromide, ammonium chloride, ammonium fluoride, and mixtures and combinations thereof.

20. The method of Claim 18, wherein the concentration of the ammonium salt is approximately 0.001 gram-moles per liter to approximately 2 gram-moles per liter of the solution.

21. The method of Claim 18, wherein the halogen salt is provided to the solution by a halogen containing compound selected from the group consisting of hydrogen chloride, hydrogen bromide hydrogen iodide, hydrogen fluoride, sodium chloride, sodium bromide, sodium iodide, sodium fluoride, potassium chloride, potassium bromide, potassium iodide, potassium fluoride,

ammonium chloride, ammonium bromide, ammonium iodide, ammonium fluoride, and mixtures and combinations thereof.

22. The method of Claim 18, wherein the concentration of the halogen salt is approximately 0.01 gram-moles per liter of solution to approximately 2 gram-moles per liter.

23. The method of Claim 18, wherein the ammonium salt is provided to the solution by an ammonium containing compound selected from the group consisting of ammonium iodide, ammonium bromide, ammonium chloride, ammonium fluoride, ammonium acetate, ammonium carbonate, ammonium chromate, ammonium nitrate, ammonium oxalate, ammonium phosphate, and mixtures and combinations thereof, and the halogen salt is provided to the solution by a halogen containing compound selected from the group consisting of ammonium iodide, ammonium bromide, ammonium chloride, ammonium fluoride, and mixtures and combinations thereof.

24. The method of Claim 18, wherein the oxidant is selected from the group consisting of nitrogen oxides, nitrosyl chloride, chlorine, bromine, iodine, fluorine, ozone and hypoclorite.

25. The method of Claim 18, wherein the oxidant is provided to the solution by the introduction of at least a first liquid reagent and at least a second liquid reagent.

26. The method of Claim 25, wherein the first liquid reagent is selected from the group consisting of hypochloric acid, sodium hypochlorite, potassium hypochlorite, ammonium hypochlorite, and mixtures and combinations thereof, and the second liquid reagent is selected from the group consisting of nitric acid, sodium nitrate, potassium nitrate, ammonium nitrate, and mixtures and combinations thereof.

27. The method of Claim 18, wherein the oxidant is introduced into the solution as a gas.

28. The method of Claim 18, further comprising heating the solution to a temperature less than approximately 150 degrees Celsius.

29. The method of Claim 18, further comprising heating the solution to a temperature in the range of approximately 50 degrees Celsius to approximately 100 degrees Celsius.

30. The method of Claim 18, wherein the pH of the solution is less than approximately 10.

31. The method of Claim 18, wherein the pH of the solution is approximately 0.5 to approximately 8.

32. The method of Claim 18, wherein the solution further comprises an acid.

33. The method of Claim 18, wherein the at least one precious metal is selected from the group consisting of platinum, iridium, osmium, palladium, rhodium, ruthenium, gold and rhenium.

34. A method of extracting a precious metal from a source material comprising:

a) charging to a reaction zone a solution comprising at least one ammonium salt, at least one halogen salt, at least one acid, water, and a source material containing at least one precious metal;

b) heating the reaction zone to a temperature of approximately 50 degrees Celsius to approximately 100 degrees Celsius under oxidizing conditions to form a slurry; and

c) separating the at least one precious metal from the slurry.

35. The method of claim 34, wherein the at least one ammonium salt is provided to the solution by an ammonium-containing compound selected from the group consisting of ammonium sulfate, ammonium iodide, ammonium bromide, ammonium chloride, ammonium fluoride, ammonium acetate, ammonium carbonate, ammonium chromate, ammonium nitrate, ammonium oxalate, ammonium phosphate, and mixtures and combinations thereof.

36. The method of Claim 34, wherein the concentration of the at least one ammonium salt is approximately 0.01 gram-mole per liter to approximately 2 gram-moles per liter of the solution.

37. The method of Claim 34, wherein the at least one halogen salt is provided to the solution by a halogen containing compound selected from the group

consisting of hydrogen chloride, hydrogen bromide hydrogen iodide, hydrogen fluoride, sodium chloride, sodium bromide, sodium iodide, sodium fluoride, potassium chloride, potassium bromide, potassium iodide, potassium fluoride, ammonium chloride, ammonium bromide, ammonium iodide, ammonium fluoride, and mixtures and combinations thereof.

38. The method of Claim 34, wherein the concentration of the at least one halogen salt is approximately 0.01 gram-moles per liter of solution to approximately 2 gram-moles per liter.

39. The method of Claim 34, wherein the ammonium salt is provided to the solution by an ammonium containing compound selected from the group consisting of ammonium iodide, ammonium bromide, ammonium chloride, ammonium fluoride, ammonium acetate, ammonium carbonate, ammonium chromate, ammonium nitrate, ammonium oxalate, ammonium phosphate, and mixtures and combinations thereof, and the halogen salt is provided to the solution by a halogen containing compound selected from the group consisting of ammonium iodide, ammonium bromide, ammonium chloride, ammonium fluoride, and mixtures and combinations thereof.

40. The method of Claim 34, wherein the oxidizing conditions are provided by a gaseous oxidant.

41. The method of Claim 40, wherein the oxidant is selected from the group consisting of nitrogen oxides, nitrosyl chloride, chlorine, bromine, iodine, fluorine, ozone, and mixtures and combinations thereof.

42. The method of Claim 34, wherein the oxidizing conditions are provided by a gaseous oxidant that is provided to the solution by the introduction of at least a first liquid reagent and at least a second liquid reagent.

43. The method of Claim 42, wherein the first liquid reagent is selected from the group consisting of hypochloric acid, sodium hypochlorite, potassium hypochlorite, ammonium hypochlorite, and mixtures and combinations thereof, and the second liquid reagent is selected from the group consisting of nitric acid, sodium nitrate, potassium nitrate, ammonium nitrate, and mixtures and combinations thereof.

44. The method of Claim 34, wherein the oxidizing conditions are provided by the introduction of an oxidant as a gas.

45. The method of Claim 34, further comprising heating the solution to a temperature less than approximately 150 degrees Celsius.

46. The method of Claim 34, further comprising heating the solution to a temperature in the range of approximately 50 degrees Celsius to approximately 100 degrees Celsius.

47. The method of Claim 34, wherein the pH of the solution is less than approximately 10.

48. The method of Claim 34, wherein the pH of the solution is approximately 0.5 to approximately 8.

49. The method of Claim 34, wherein the at least one acid is selected from the group consisting of sulfuric acid, nitric acid, hypochloric acid, phosphoric acid, and mixtures and combinations thereof.

50. The method of Claim 34, wherein the at least one precious metal is selected from the group consisting of platinum, iridium, osmium, palladium, rhodium, ruthenium, gold and rhenium